Towards improving AMSR-E soil moisture algorithm accuracy and expanding its applicable region: field experiments and data assimilation

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1. Background and Objectives

1.1 Background

- Advantages of AMSR-E: Multi-frequency, High Resolution;
- Soil moisture retrieval algorithm development:
  - Overestimates soil moisture in very dry region;
  - Parameters are needed to be acquired from ancillary data sources in advance;
  - Various resolutions for different parameters.

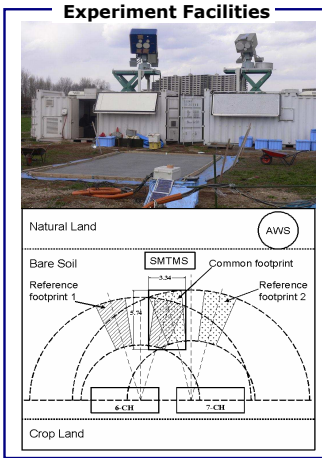
1.2 Objectives

- To improve the soil RTM to include the volume scattering effects of dry soil medium;
- To improve the understanding of vegetation effects;
- To develop a new method for parameterization.
- To validate new RTM and new parameterization method with in situ observation

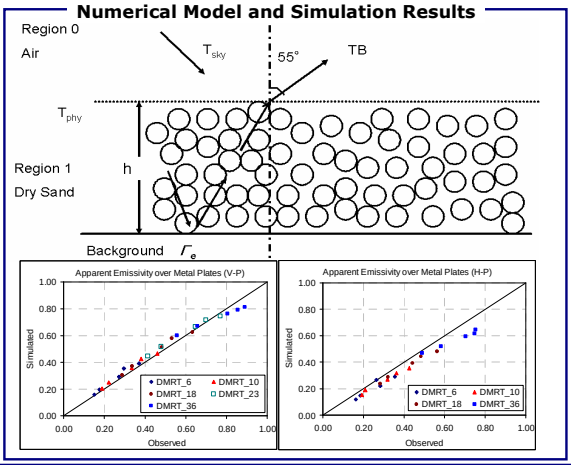
2. Improving Soil RTM

- The development of RTM includes works in two aspects:
  - Field Experiments: Using ground based microwave radiometer (GBMR)
  - Numerical Simulations: Using state-of-arts electromagnetic model: DMRT
- The soil RTM is consists of:
  - Volume scattering dominative RTM: DMRT;
  - Surface scattering model: Advance Integral Equation Method (AIEM)

Experiment Facilities

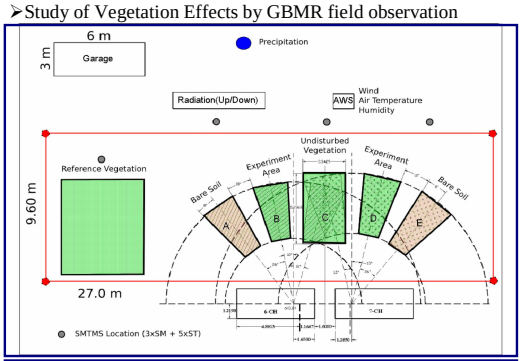


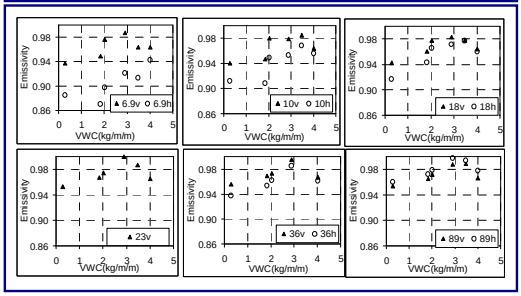
Numerical Model and Simulation Results



3. Studying Vegetation Effects

- Study of Vegetation Effects by GBMR field observation

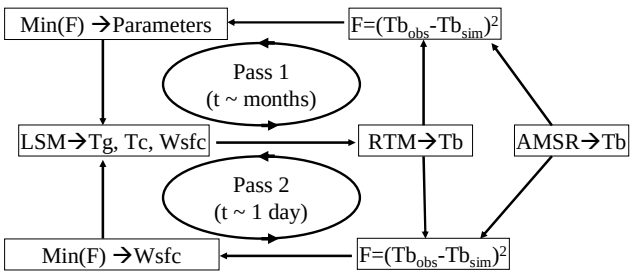




4. New Parameterization Method: LADS-UT

- LDAS-UT is consists of:

  Land Surface Scheme: SiB2; Optimizing Scheme: Shuffle Complex Evolution (SCE); Model Operator: Soil RTM + Vegetation RTM .
- Algorithms of LDAS-UT: dual-pass technique
  - Pass 1: optimize model parameters
  - Pass 2: data assimilation

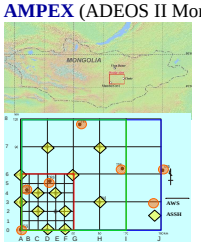


➢LDAS-UT is able to estimate land parameters from meteorological forcing data and remote sensing measurements.

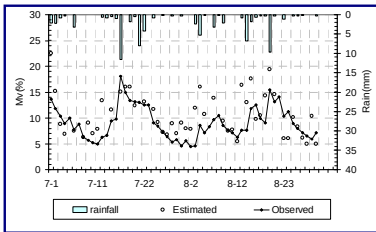
5. Validation on Mongolia site

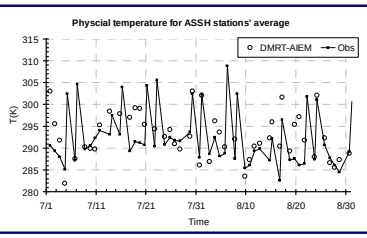
5.1 Parameterization

AMPEX (ADEOS II Mongolian Plateau EXperiment for Ground Truth)



Stations	A3	C2	E4	G6	H7	Avg
SAND (%)	46	40	42	46	39	40
CLAY (%)	18	20	20	20	19	20
Bulk density (g/cm^3)	1.40	1.52	1.51	1.46	1.53	1.50
rms *h* (cm)	0.38	0.40	.025	0.25	0.20	0.25
l (cm)	0.44	0.49	0.33	0.33	0.34	0.39





6. Conclusion and Outlook

- The AMSR-E soil moisture retrieval algorithm is updated through:
  - ☐ Improving the soil RTM; ☐ Developing a new parameterization method;
- The updated algorithm is successfully validated on in situ observation at Mongolia site;
- Future jobs include:
  - ☐ Improving vegetation RTM; ☐ Including frozen/thaw RTM; ☐ Vegetation fraction coverage.

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